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Towards a more explicit account of the transformation: Reply to comments on 'An integrative review of the enjoyment of sadness associated with music'

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1. Introduction

Our integrative framework for explaining the enjoyment of sadness associated with music sparked a delightful number (13) of commentaries which challenge, stimulate, strengthen and shape the ideas we initially put forward. Here we organise our response around five central themes brought up by several commentators. These relate to questions about (a) the nature of sad music, (b) whether music can induce genuine sadness, (c) details of the transformation, (d) music as a technology for emotion regulation, and (e) broader implications and extensions.

1.1. What is sad music?

The problematic definition of what sad music actually is raised discussion and criticism from our commentators. For instance, both Swaminathan [1] and Zentner [2] claim that music itself cannot have fundamental properties associated with sadness. We agree – and did acknowledge in our premises – that the features of the music cannot be the sole way of defining what is sad music since other mechanisms (memories, conditioned responses, situational factors, lyrics) often have a major influence on any emotion experienced in the context of music listening. Similarly to "beauty", also musical "sadness" can be seen as emerging from the interaction between the listener and the music (see p. 13). However, there is also evidence that music can express emotions such as sadness that are conveyed/recognized across cultures [3, 4]. The explanation suggested by our integrative framework is not dependent on the actual features of the music to explain the pleasure derived. We emphasize the importance of cultural influences on what is considered "sad" in the context of music, but at the same time we see the value in linking the commonly reported properties of sad music to physiological states (which could be one of the reasons why similar musical elements may be found in different cultures).

Zentner, for instance, agrees with our summary that music itself may express sadness through shared cultural conventions, and contrasts this expressed sadness with known features of music that are universally found aversive, such as dissonance (although the universality of this has recently been challenged [5]). The first concern is in agreement with our premise that the context, and other non-musical aspects (lyrics, narrative, acquired codes) are needed to convey sadness. This does not, however, dispel the notion that certain kind of music could be called sad, or used to express sadness. In our framework, we discussed the features of sad music that are assumed to reflect or imitate (sad) physical states, and thus should be similar across cultures, and other features that are most likely the products of cultural evolution. Moreover, as the title of our framework article declares, we did not aim to formulate an integrative theory about "sad music" but rather "sadness associated with music".

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Wassiliwizky [6] argues that we conflated sadness elicited by musical elements and sadness elicited by lyrics. In our opinion, we were explicit about the difference between the two (e.g., sections 1.1 and 4.3), and offered specific explanations regarding how lyrics may amplify emotional responses through transportation or identification (section 3.2). We also agreed with Nussbaum’s [7] notion that music is able to add the kind of conceptual input to the experience that text alone cannot produce, but this also works vice versa: lyrics provide their own conceptual input that can strengthen or alter the impact of expressive musical cues. In our own empirical studies we have typically been careful not to conflate the two, and have carried out studies using either instrumental music exclusively [8, 9], or compared the effects of instrumental, unfamiliar music with those of self-selected, familiar music containing lyrics [10]. We agree that different domains (i.e., musical features and lyrics) need to be related to their respective mechanisms [11, 12]. However, we want to reject the view of “absolute music” that has no semantic meaning, and to emphasize that even instrumental music has semantic connotations and learnt associations related to its genre, instrumentation, and extramusical information. Thus, we think it would be rather naive to claim that musical effects could be differentiated entirely from semantic the effects of lyrics, since music conveys its own semantic information that is closely associated with verbal information through cultural practices and learning. Interaction between the musical material, lyrics, and personal associations is fundamental in the construction of emotional meaning related to a piece of music, as we expressed in our text (section 4.3).

Tervaniemi [13] tackles a particular – often controversial – aspect of sad music, namely the long-held Western view that sad music is associated with the minor mode. She summarises past observations regarding the prevalence of the major and minor modes in historical and geographical accounts, which have revealed clearly demarcated regions dominated by minor modes. In our framework, these regional differences are reflections of the cultural patterns, that may – to some extent – have their origins in the inherent differences modes (such as the minor mode being more dissonant, more ambiguous in terms of its root chord, and less frequent in music than the major mode [14]. These characteristic attributes of the minor mode are with increased uncertainty, which in turn is thought to be associated with negative emotions. In Western music, the minor mode tends to account for a third of all music, at least if we base the estimate on all 30 millions songs available at Spotify¹. However, the apparent association between sadness (both felt and perceived) and the minor mode could also be just a particular convention in contemporary Western culture.

Although the focus of our review was on the listener and his/her meaning-making processes, we did not ignore the fact that music is always composed and performed by somebody, and thus it is no coincidence that there are established expressive devices and conventions for the expression of sadness in music (see section 4.1). Perhaps a helpful way to clarify the sticking points raised by Swaminathan [1] and Overy [15] about the different possibilities afforded by the expression and induction of sadness in music, is to project them onto a plane (Figure 1). “Sad” musical expression created by the composer and the expressive cues utilised by the performer both contribute to the successful communication of an emotion [16]. However, this communication (and recognition) of emotional expression does not necessarily lead to the *induction* of the same emotion in the listener. Similarly, a person can experience sadness without the presence of sad expressive cues in the music through unique episodic memories or meanings generated by the lyrics. Such music has previously been called *Self-Identified Sad Music* (SISM, [17]), and should be differentiated from *Music Expressing Sadness* (MES). If the emotional expression and induction are both consistent with sadness, then we would call this *Invariably Sad Music* (ISM), although our premises (e.g., emotions are constructed and require learning) and earlier points (iterated above) posit that such music is by definition exceedingly rare (or does not exist at all). However, this does not mean that analysing the actual musical features in all these cases would be meaningless – on the contrary – and as Overy [15] suggested, music analysis could chart the ways composers and performers intuitively steer listeners’ emotional experiences through careful treatment of musical structures, conventions and expressive devices across time.

1.2. Can music induce genuine sadness?

Swaminathan [1], Zentner [2], and partially Pelowski, Ishizu and Leder [18] are doubtful whether sad-sounding music is able to induce genuine experiences of sadness. But what exactly differentiates “genuine”

¹<https://insights.spotify.com/us/2015/05/06/most-popular-keys-on-spotify/>

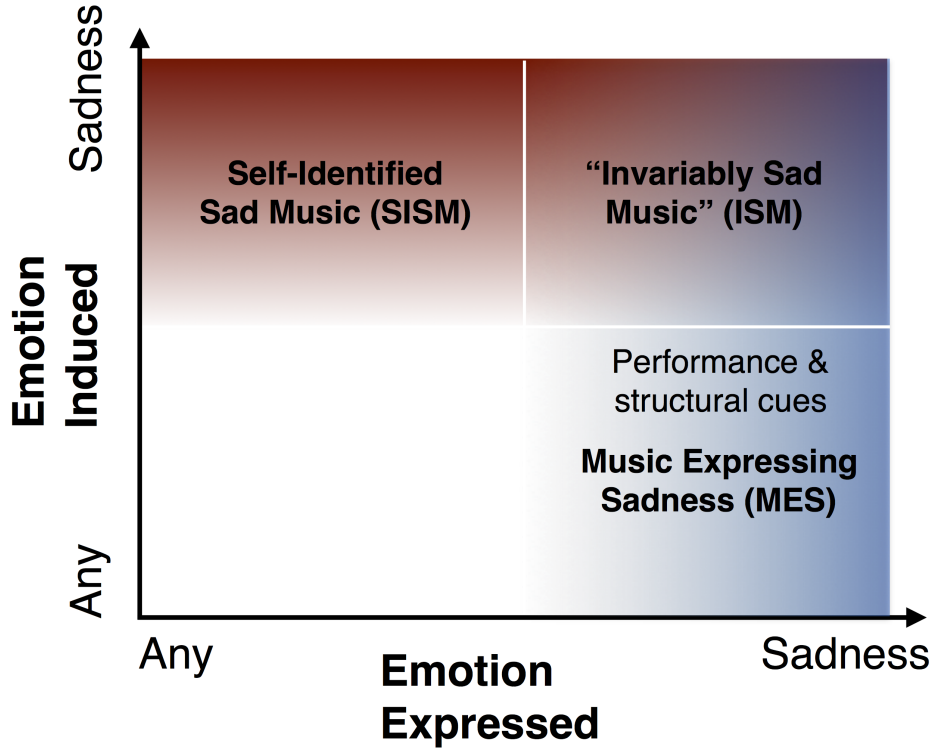


Figure 1: Varieties of sad music (self-identified sad music, music expressing sadness, and invariably sad music).

from "non-genuine" sadness; is it a matter of intensity, or rather a matter of valence (i.e., genuine sadness is always negative and unpleasant)? In either case, claiming that music cannot induce genuine sadness ignores the evidence provided by several studies using a variety of methods (open responses, field observations, surveys, lab experiments with self-reports and indirect measures). Secondly, even if the overall experience of listening to sad-sounding music would be positive and pleasurable, would it be wrong to label the induced emotion as "sadness", if the emotional expression and the subjective experience are perceived and interpreted as sadness? In the following sections, we will unpack these points in more detail.

Zentner argues that there is little evidence to suggest that listeners actually experience genuinely sad feelings such as despair, grief, helplessness, and disappointment in the context of music listening. However, this is not entirely true; Gabrielsson, for instance, has reported numerous examples of music-induced despair and hopelessness in the context of strong experiences with music [19]. Our findings from a large dataset of open responses to a question about experiences associated with music and sadness further corroborate the observations made by Gabrielsson [20]. These studies demonstrate that music is capable of inducing both very intense and decidedly negative sad experiences, and it is worth noting that such open responses are not constrained by a set list of adjectives or emotion descriptors provided by researchers. Furthermore, a controlled laboratory experiment comparing the emotions induced by experimenter-selected (unfamiliar, instrumental) sad-sounding music, self-identified sad music, and sad autobiographical recall [10] using indirect measures of emotion revealed that music can induce similar cognitive biases in memory and judgment as an autobiographical recall task involving a sad event. As pointed out by Zentner in his commentary, these cognitive biases were stronger in the case of self-selected music compared to experimenter-selected, unfamiliar music, and trait empathy was positively correlated with the degree of bias induced by the experimenter-selected music. However, we do not interpret these findings as suggesting that music-related episodic memories or special personality traits would be a prerequisite for experiencing "genuine" music-induced sadness: The personal relevance and significance of a given piece of music would undoubtedly contribute to a more intense

emotional experience (regardless of the type of emotion) compared to unfamiliar music, while those who are more sensitive to emotional contagion and the observed experiences of others would also be more susceptible to such experiences in the case of music listening – and that these individual differences may be particularly salient in “artificial” experimental settings that are not very conducive for immersive, intense emotional experiences. The fact that even unfamiliar, instrumental music heard in a laboratory setting was able to induce significant sadness-related judgment biases in a considerable portion of listeners suggests that such experiences cannot be infrequent in the context of real-life music listening (which often involves self-selected music).

Nevertheless, it is important to acknowledge that sadness is not among the most common emotions experienced in connection with music. Surveys of the general prevalence of different music-induced emotions place sadness among moderately frequently experienced emotions: In a survey of 141 Swedish listeners, sadness was ranked 8th out of 44 emotion terms in terms of the frequency of felt emotions in response to music [21]. Furthermore, in a cross-cultural survey involving 668 participants from 6 countries in 5 different continents [22], sadness received a mean rating of 4.04 (on a scale from 1=rarely, to 7=often) with regard to its frequency of occurrence in response to music listening, ranking 8th (out of 15 emotion labels) overall. In the same survey, sadness also emerged as the third most prevalent emotion (out of 15) in retrospective evaluations of the participants’ most recent music-induced emotional episodes [22]. This suggests that while sadness might not be the most frequent emotion induced by music, it is nevertheless a highly relevant emotion label that is consistently nominated across multiple studies and cultures.

While the aim of the aforementioned survey studies has been to explore the full range of emotional experiences induced by music (where positive feelings such as happiness, enjoyment, and relaxation tend to be more common), studies investigating the emotions induced by specifically “sad” or sad-sounding music might be expected to reveal a somewhat different picture. Zentner draws attention to the study by Taruffi and Koelsch [23], where participants were asked to “indicate the emotions that they frequently experience when listening to sad music” using the 9 emotion factors of the Geneva Emotional Music Scale [24]. The results revealed that the factors nostalgia, peacefulness, and tenderness were nominated more frequently than sadness. However, there are several reasons why this result is neither surprising, nor invalidates the premises or assumptions we have put forward: First, nostalgia – the most frequently nominated factor – was measured using three emotion labels: Nostalgic, dreamy, and melancholic, suggesting that this factor probably captured the more pleasurable and less intense variants of music-induced sadness. Second, it may be that frequency rankings of emotion terms do not reveal the underlying picture in a representative manner; it might be that sadness co-occurs with tenderness, nostalgia and peacefulness to different degrees, and when potentially overlapping terms such as tenderness and peacefulness are captured, the remaining structures could actually tell a more nuanced story. Third, recruiting a convenience sample to a study involving music and sadness tends to draw out those who actually enjoy listening to sad music, thus potentially biasing the overall picture by giving more emphasis to the positive emotional aspects. In one of our previous studies investigating the emotional experiences associated with music and sadness, a large convenience sample (N=1577) revealed a more positive emotional palette compared to two representative samples (N=455 and N=414) that were recruited without any emphasis on sad music [20]. It is also worth noting that “sadness” was the highest ranked emotion label in all three samples, but because we had a larger selection of terms than Taruffi and Koelsch (including the GEMS and those utilised by Taruffi and Koelsch), we could analyse the latent constructs characterizing the experiences. This resulted in three factors comprising one negative (grief) and two positive constructs (comforting and sublime sorrow) that were connected to different reasons, mechanisms, and physical reactions.

Empirical evidence from several (but not all) listening experiments also demonstrate that listeners rate sadness as the most intense emotion when listening to either self-selected sad music [10] or unfamiliar music chosen by experimenters [8, 10] - even when using the GEMS to rate their emotional responses [9]. As Zentner points out with reference to Taruffi and Koelsch’s survey study, *nostalgia* and *peacefulness* might be the most prevalent emotions when broad survey methods are used to probe the experiences. But in these cases, the scope of what actually is at play is too wide, conflates the mechanisms involved, and offers a biased representation of those who seem to be using sad music for relaxation and calming down. In summary, the picture that emerges from all these studies is consistent with our assumption that emotions associated with

sad music are linked to a wide spectrum of emotional experiences, in which sadness plays an important role – even to the extent that in the most negative of these experiences (that constitute a minority of all experiences associated with sad music) it is indistinguishable from real-life sadness.

Finally, Zickfeld [25] takes the question of music-induced sadness into a more refined direction by asking for a more detailed and clearer definition of the different types of music-induced sadness, and particularly what the features are that distinguish them. As Zickfeld acknowledges, we have done our share of such mapping exercises, combining reasons, mechanisms, physiological reactions, and the types of sad experiences using open responses [26], nationally representative surveys [20], and laboratory experiments [8, 27]. The two varieties of music-induced sadness with pleasurable components that have emerged in our previous studies – *moving sadness* and *relaxing sadness* [8], or *sublime* and *comforting sorrow* [20] – constitute indeed the types of experiences that we attempted to cover in our broad theoretical overview. The specific labels chosen to represent these types of experiences are bound to the present time and culture. Victor Hugo’s well-known quote, “melancholy is the enjoyment of being sad” (Victor Hugo 1866, translated by James Hogarth, 2002), serves as a typical example of such values in nineteenth century Europe, which we cover more fully in section 4.2 of our original article.

1.3. Details of the transformation

Inherent in our framework was the notion of *transformation*. For several commentators, this either seemed to pose a problem, or required more explicit definition of the time-scales, or could be simply reframed as something else. Thompson and Olsen [28] provide a clever proposal of the last issue, where they reframe the transformation in a way that sidesteps the paradox entirely: By treating cognitive and experiential dimensions as separable components, this dispels the need for the transformation. However, they also expand the explanation outside this two-dimensional scheme by introducing other processes involving learning, emotional work, and group identity, which will be addressed later. Wassiliwizky [6] prefers to explain this phenomenon as *co-activation* and is sceptical about transformation. To our view, such instantaneous activation is at odds with findings from neuroscience, where any neural process takes time and different types and levels of processes take up different amounts of time [29, 30]. For instance, Wassiliwizky raises the importance of lyrics and meanings to the pleasure, which is already another process beyond mere recognition of emotions and induction of emotions. Wassiliwizky points to some interesting data on the temporal overlap in physiological measures they interpret as indices of sadness and pleasure as evidence for the co-activation model. However, their own data [31] tracing the changes in skin conductance and activations in the nucleus accumbens during the chill reactions related to poems show peak in skin conductance before the peak in the BOLD signal in the nucleus accumbens. This suggests that “transformation” might actually be a plausible way of describing these dynamic changes, or that these processes simply operate on different time-scales.

To simply state that the underlying processes that give rise to pleasure and sadness take place simultaneously is in our view rather an oversimplification. Nothing is instantaneous, and even mixed-emotion explanations [32, 33] commonly posit that changes might be *rapid*, but not instantaneous. Mixed emotions can also be constructed through meta-emotions, where the meta-appraisals and core affects can be at the opposite ends of the valence dimension [33]. According to our reading, this is something that Wassiliwizky endorses as well. It is unlikely that such co-activated emotions at different levels would have an identical rise time and duration, especially when they are likely to utilise different neural mechanisms [34, 35]. Implicitly, co-activation is not even upheld by the Distancing-Embracing model [36], since it advocates meta-appraisals and aesthetic framing, which typically require time to process and change the experience. Our strategy was to acknowledge the temporal nature of the process by describing the different processes at different levels, although we did not outline the exact timescales in sufficiently detail. This was something that Overy [15] and Pelowski and his colleagues [18] were critical of as well.

Pelowski, Ishizu and Leder [18] offer a decidedly analytical response focussed on neuroanatomical explanations and two insightful alternative accounts. They surmise that the hypothesis for the hedonic shifts has merit, but the evidence from neuroscientific studies might not have yet captured the proposed shifts, since the temporal resolution of fMRI and the spatial resolution of EEG and MEG are limited. More critically, they also point out that we have not attempted to put a definite time-scale for the different hedonic shifts involved. Our response is that while it probably depends on the level of explanation in question, the lowest

levels would have the fastest pace of change (seconds) and the dawning of cultural meaning would take longer (tens of seconds, minutes or more). This is a very helpful suggestion and a prerequisite for pinning down the changes through empirical experiments. The alternative explanation they pose is more fundamental; perhaps people do not experience actual sadness at all when exposed to art. They summarise the fMRI studies that have not provided any evidence of activation in the regions involved in sadness, but rather reward and pleasure. Our premise agrees in principle that pleasure is what often occurs when listening to music associated with sadness, but we are critical of equating activation of brain areas and experiences quite so simplistically for the following reasons. First, the search for specific brain areas for different basic emotions (incl. sadness) has not yielded clear mappings of brain areas and emotions [37, 38] and second, not all of the studies that Pelowski and his colleagues refer to have actually studied musically induced sadness, such as the research involving minor and major chords [39] or the research by Kawakami and others [40] with excerpts too short for reliable emotion induction [41].

Incidentally, contrary to the interpretation of Pelowski et al., we do acknowledge that Trost and her colleagues [42] differentiated sadness from nostalgia (or more precisely a high-valence low arousal quadrant encompassing nostalgia, tenderness, peacefulness and transcendence) as we cite this paper as an example of imaging studies on music-induced sadness several times. However, the musical material used by these scholars for inducing nostalgia was also rated high on sadness, and thereby presumably activated the same regions as the more "purely" sad pieces, as well as regions associated with the high-valence low-arousal quadrant including the ventral striatum.

Finally, Jacobsen [43] offers an illustrative account of how the temporal trajectory of enjoyment of sadness might differ across emotional involvement, cultural practice and overall context. Some of these ideas are worked out more fully as a chronometry for aesthetics in a review study by Brattico, Bogert, and Jacobsen [44], which we designate as the initial source of inspiration for drawing specific assumptions about the time-scale of these processes. Jacobsen reminds the reader of Gustav Theodor Fechner's proposal to combine objective and subjective elements in the study of the human mind that he introduced nearly 160 years ago. This path is still pursued by the contemporary psychology and neuroscience, but has rarely been expanded to the arts, with the exception Jacobsen's [45] formulation about a decade ago. Perhaps more interestingly, Jacobsen continues to delineate the cultural level more carefully into the ways this topic is dealt with in cultural sciences and social sciences. Moreover, he suggests that the analyses of the phenomenon should be more explicit about the evolution of certain cultural practices in history in comparison with the the broader concept of the minds equipped to handle such operations. We embrace this suggestion, and do in fact associate our cultural level with the diachronic perspective without explicitly calling it such, and assume that the biological and psycho-social levels utilise elements that are not exactly dependent on the particulars of history (what might be called synchronic account). While we acknowledge that this is important, we have already provided a handle for most of the elements Jacobsen suggests to be involved (such as episodic knowledge of the pieces and lyrics). His second main theme is to emphasise the situated nature of these experiences, which we initially covered in our premises (v), including the personality traits that Jacobsen suggests to add to studies on the topic.

Swaminathan criticizes our concept of hedonic shift at the cultural level, since we posited that the cultural level is usually neutral or positive whereas the lovely example she offers – "Strange Fruit" by Billie Holiday – seems to imply that the cultural level is directly referring to strongly negative emotions. Our claim is that the cultural level is something that typically transforms the experience into something more positive despite the negative connotations and underlying facts (or because of these, actually). "Strange Fruit" fits well within the framework, where the cultural connotations and strong evocative lyrics lend gravitas and sadness to a track that would otherwise be a rather simple jazz ballad. Thus, the quest for separating the textual meaning from musical semantics is, as we see it, a mission impossible (see our comments on the criticism by Wassiliwizky earlier). We acknowledge that there may be pieces of music that were written to enhance negative affect, just like the one mentioned by Swaminathan. Sometimes it certainly is useful to temporarily amplify negative emotions in order to achieve long-term goals [46]. However, those instances were not in the focus of our review. Swaminathan also remarks that we have not addressed the imagined presence of others in music listening, although we quite strongly make this point in our section 3.2.

Finally, in support of our framework of transformation, Saarikallio [47] proposes that music actually does

not always have to traverse faithfully through all the different levels or components in order to be effective; in fact, the strength of music is in its ability to bypass the conscious components of the process, and this capacity may speed up the process of transformation or at least explain why it appears to be a paradox to our rational minds.

1.4. *Music as a technology for emotion regulation*

Several commentators offered interesting accounts of pleasure derived from sad music that emphasised the functional role of music as a medium for reflection or regulation. Saarikallio [47] confronts the notion of a paradox of pleasure derived from sadness, and argues persuasively that this process is more akin to the stabilisation of hedonic balance. In other words, the process of enjoying sadness associated with music is part of the adaptive emotional processes aimed at regulating our well-being. From our perspective, it is gratifying to realise that Saarikallio is able to understand our framework as explaining the process rather than simply exposing elements of a conflicting paradox. She also has several bold improvements to suggest. One is to explain the process in more detail by bringing in an emotional processing framework constructed in the context of psychotherapy [48]. This model adds details with respect to different levels of awareness in different parts/levels of the process, and how they are assumed to be linked with embodiment or conceptualization. The notion of different levels in this model is not only compatible with our three levels of explanations, but the processing loops within the components of emotional processing advocated by Greenberg and Pascual-Leone resemble several aspects of the hedonic shifts we postulated, and connects them to psychodynamic processes. Finally, Saarikallio broadens the scope of the implications of the extended framework by suggesting that the study of music-related sadness is actually examining the very processes involved in genuine human sadness.

In contrast, Taruffi [49] offers a slightly different perspective to the way hedonic shifts might work by proposing that sad music operates as a vehicle for self-reflection. The evolutionary argument is that the adaptive benefit of sadness in general is to turn the attention inwards, which allows the conservation of resources and the reorganisation of current beliefs and motivations. Taruffi provides convincing evidence that sad music could be capitalising on this notion. Firstly, music that has tranquil characteristics (such as sad music) is conducive to invoking self-referential thoughts [50] and activates the Default Mode Network (DMN) which gets engaged when attention is directed inwards. However, this account does not immediately explain the possible pleasure of such inward-directed attention. Taruffi proposes that the pleasure is generated by musically facilitated re-framing that allows a person to change their perspective when faced with a concern or a problem. This is an acceptable explanation for such functional uses of sad music where the listener is experiencing adversity in real life, and seeks to rectify this with the help of music. What it does not explain is the non-functional use of sad music; why would someone having a normal day tune in to sad music and, in particular, derive enjoyment out of the music? Perhaps the simulation of emotions involved in the process of recognition could be argued to introduce a temporary adversity or negative feelings which are then resolved through this cognitive switch, and that this conflict resolution is somehow inherently pleasurable. This particular chain or sequence where inward attention leads to pleasure is not yet well elucidated, but we are enthusiastic about the concrete and measurable possibilities that this area opens up.

With respect to the brain substrates of this process, simply paying attention to the DMN is perhaps not a sufficient mode of explanation, since it is implicated in a variety of tasks from memories to predicting future and social interaction [51]. Nevertheless, combining the chronometry involved in DMN changes with self-reports switching from neutral to experiences of sadness and mind-wandering might be a promising way to corroborate or challenge the idea of hedonic shifts or more broadly to understand the temporal processes involved. Overall, Taruffi makes an important point about the need for self-reflection in the hectic contemporary societies. This echoes some of the arguments made by Theodor Adorno [52] about the commodified music consumption in modern societies, and any reflection and respite offered by music would make such an activity something rare and valuable.

Krueger [53] calls for a better understanding of the phenomenology of the experiences at stake here. He suggests that an enactive approach to cognition could be an insightful set of conceptual tools that fully incorporate the bodily processes and interactions with technological resources that we utilise as a vital source of information. While our framework does build on bodily and physiological processes, the idea of external

resources that help us to execute complex tasks is of great value here. As Krueger reminds us, music has already been suggested to be a medium and technology – even suggested by some [54, 15] to be superior in comparison to non-musical emotional expressions – for offloading parts of our emotional regulation. This perspective takes a much more active stance towards the functional nature of these experiences, which we have not fully appreciated in our framework. Building on this perspective, Krueger offers the experience of letting go as an additional element for the framework. The notion of letting go characterises immersive, strong experiences with music. Further, letting go is characterised by a decreased sense of agency and control, which is described in listeners’ narratives as a deeply pleasurable experience [55, 19]. Looking at the case examples offered by DeNora and Gabrielsson, it is not clear whether these experiences are specific for sadness, or more general for music. However, we might interpret the sense of letting go as being part of the phenomenology of being moved [56], discussed in some detail in section 3.1 of our article, and expanded by other commentators. Krueger also suggests that the enactive paradigm to music and sadness would go beyond our simulation account, since it would be more useful to talk about how music offers a way of scaffolding these experiences. In general, the points brought forward from an enactive point of view match well with the ways in which individuals use music to regulate their emotions [57]. While working through one’s own sadness with the help of music rather resembles the strategy of “mental work” in Saarikallio’s model of emotion regulation, we propose solace to be the prominent strategy applied in the context of listening to self-identified sad music.

In fact, if we examine these commentaries by Saarikallio, Taruffi, and Krueger from a broader perspective, we can see that they all contribute to a larger picture that is in no way conflicting with our proposal. Music is seen as a medium for affective experiences, conscious reflection and mental work, or as Saarikallio [47] puts it: “an embodied-fictional-conceptual playground for real experiences”. In our manuscript, we referred to these qualities with the concept of “affective sandboxing” [58], which is in line with the constructivist view on emotions and simulation theory. Similarly, as we mentioned in part 3.1, empathic responses to music enable the listener to explore emotional experiences in a safe setting, because music can provide conceptual knowledge about emotions – in this case, sadness.

Perlovsky [59] offers a perspective that could also be interpreted through regulation; music is a way to reconcile cognitive dissonance in a way that preserves the acquisition of novel ideas and thus is a mechanism that is essential for cultural evolution. Cognitive dissonance refers to a well-established finding where holding two conflicting cognitions simultaneously causes discomfort and some studies have demonstrated that music can be a viable manipulator of cognitive dissonance [60]. However, whether the cognitive dissonance theory offers more fine-grained predictions of this particular phenomenon at a biological and psycho-social levels, is yet to be determined.

1.5. Broader implications and extensions

Thompson and Olsen [28] reflect on the proposed framework through another paradox involving pleasure and a nominally negative emotion, namely the enjoyment of Death Metal music by the fans of such music. This parallel is a insightful one, since it challenges our notion that this enjoyment of putatively negative emotion is specific to sadness. Their account also expands the scope of the explanations to include enhanced group identity, enjoyment of violent music through learning, and through the affirmative role of lyrics. However, they also articulate a notion where these experiences build resilience through reframing and re-experiencing difficult emotional states detached from their real-life circumstances, which is undoubtedly something that is relevant for sad music as well. This capacity of music to offer a safe haven for processing difficult emotions implies that we are dealing with complex, layered and perhaps even sequential processes – even consisting of the hedonic shifts that we postulated – when appreciating violent music, and the appeal of such a fascinating genre cannot be attributed to one simple mechanism. This is exactly what we surmised in the context of sad music as well. Thompson and Olsen provide lurid, testable hypotheses that will allow to verify or dispel the notion of hedonic shifts in the context of listening to violent music.

Zickfeld [25] interprets the phenomenon of pleasurable sadness through another recent framework dubbed *kama muta* [61] that has mainly been explored within the context of specific narratives (usually film clips) and autobiographical accounts. This idea largely overlaps with the components we have offered; it shares three components (social surrogacy, being moved, and empathy) and mechanisms (memories and lyrics) with

the framework that we presented. It therefore offers a theoretical framework in which many of the aspects that add to the enjoyment of sad music can be integrated, but its validity in the musical domain remains to be determined by empirical research. Further, we want to clarify that the feeling of connection or oneness with the artist or composer certainly is an important aspect of music as a social surrogate, but it cannot be reduced to it. The concept of social surrogacy is broader and includes other facets such as feeling connected to absent relationship partners with the help of music or transportation through lyrics [62].

Zickfeld reminds us that some of the observations in previous literature concerning being moved and liking in the context of sad music are merely correlational, and this of course holds for most of the research on kama muta as well; in an excellent meta-analysis of 16 studies [63], the observed relationship between empathic concern and being moved was similarly correlational (and thus the two cannot be fully disentangled), and it cannot yet be determined whether the two components – being moved and empathic concern – tap into a yet unknown – or unmeasured – property. Nevertheless, we are excited about the similarities between the two frameworks, and the potentially important role of narratives of coming together and of love overcoming adversity. These narratives are plausible cultural scripts that may be mapped onto being moved through empathic concern, because people with high empathy could be assumed to be sensitive to particular kinds of cultural scripts for emotions.

2. Concluding comments

Ultimately, the value of our integrative review is measured by the advances in research it is able to stimulate. We have sketched out ways to reconnect a number of stray observations made in past studies, and imposed limits on the extent of inferences that can be made within any of the explanatory levels. Even if the idea of cascading hedonic shifts is found to be non-essential for explaining the pleasure at some point in the future, our review has already served its purpose in sharpening the ideas concerning such possible shifts. As many commentators pointed out, the shift and the paradox itself are intrinsically linked to the definitions of sad music and whether music actually induces sadness in listeners. In our framework, we did not take sad music as the starting point, since we acknowledge the wide range of musics and mechanisms that can potentially induce sadness. The second concern about experiencing sadness is somewhat more complex, and requires and account of the prevalence of sadness among the emotions commonly experienced in the context of music. We also provided several counter-examples to the claim that music cannot induce genuine sadness, and reiterated how several studies have shown that the emotional experiences associated with music and sadness can actually be divided into distinct types; two generally pleasurable types (being moved, relaxed) and one negative (grief) depending on the amount of contextual information and types of emotion-induction mechanisms involved.

With respect to the fundamental process of transformation, commentators suggested a number of direct *amplifiers* (the act of letting go, by-passing the conscious processing of emotions) and possible *fundamental functions* of this self-reflective process (mind-wandering, reduction of cognitive dissonance). Some of the suggestions by the commentators seemed to be variants of the processes we already outline in our review (social agency, hedonic balance, variants of mood regulation), or pointed out similar processes covered by another theory with a broader scope (enjoyment of violent music; kama muta; the embracing-distancing model). We are not suggesting that music would be particularly unique way of achieving pleasure through sadness, since it easy to see the similarities in the ways negative emotions might be associated with pleasure in other forms of art. However, our framework, together with the notion that music is highly specialised form of technology for emotion regulation, spells out interesting implications regarding the functions that music may serve (something that we did not discuss in the original framework). Since it was also suggested by Wassiliwizky [6] that no transformation is needed to account for the enjoyment, the next years will reveal whether the co-activation or the transformation account is the more parsimonious way of explaining pleasure derived from music associated with sadness.

Several commentators wished to see a more explicit time-scale of the hedonic shifts. While we mentioned that to be the main aim for future studies, we agree that some rough assumptions regarding the temporal duration of these processes would have made the framework stronger. In our response we have at least started to pin down the likely durations of changes at the different levels. The temporal dynamics of the

process is a topic that can be empirically studied, and we anticipate similar trajectory of studies that theories and mechanisms of emotion regulation have witnessed over the last years [64]. For instance, the regulation of negative emotions has highly differentiated temporal processes with respect to re-appraisal and distraction [65]. We predict that the enjoyment of sadness associated with music has similar differentiations across mechanisms at the different explanatory levels and even within the levels.

Pleasure derived from sadness associated with music draws on innate, biological capacities of mind and body, as well as on culture acquired through active participation within social systems. Most commentaries focused on the psychological and biological levels, and only a few expand on the (perhaps) most challenging level, the cultural one, in detail. In our original paper we were cautious of drawing strong conclusions on the basis of contemporary Western practices, and expressed concerns over a possible Western bias, as well as the changes in the emphasis on art and sadness throughout Western history. In a way, the research on kama muta is ahead of game in this respect, since it has already pooled evidence from several cultures and has tackled the question of language and semantic issues in an elegant way [61]. However, we do not think our topic could be entirely subsumed under the rubric of kama muta despite the apparent overlap in reactions and emotions. Instead, the work conducted to elucidate kama muta experiences is an impressive example of a fruitful programme of research towards understanding the topic which is highly shaped by cultural conventions. Taken together with the other recent theorising around pleasure drawn from negative emotions in arts [36], this attests that the topic itself is sufficiently mature to be tackled seriously. In conclusion, we feel that the constructive feedback undoubtedly improved our initial framework, and brought up issues and directions that would have merited more attention in our original text.

References

- [1] S. Swaminathan, When is positive affective response to sad-sounding music paradoxical?: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* doi:https://doi.org/10.1016/j.plrev.2018.03.015.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300526>
- [2] M. Zentner, A sadness-independent account of the enjoyment of music-evoked sadness: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* doi:https://doi.org/10.1016/j.plrev.2018.03.004.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300411>
- [3] P. Laukka, T. Eerola, N. S. Thingujam, T. Yamasaki, G. Beller, Universal and culture-specific factors in the recognition and performance of musical emotions, *Emotion* 13 (3) (2013) 434–449.
- [4] T. Fritz, S. Jentschke, N. Gosselin, D. Sammler, I. Peretz, R. Turner, A. D. Friederici, S. Koelsch, Universal recognition of three basic emotions in music, *Current Biology* 19 (7) (2009) 573–576.
- [5] J. H. McDermott, A. F. Schultz, E. A. Undurraga, R. A. Godoy, Indifference to dissonance in native amazonians reveals cultural variation in music perception, *Nature* 535 (7613) (2016) 547.
- [6] E. Wassiliwizky, At the root of the paradox: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* (2017) –doi:https://doi.org/10.1016/j.plrev.2017.12.008.
URL <https://www.sciencedirect.com/science/article/pii/S157106451730194X>
- [7] M. C. Nussbaum, *Upheavals of thought. The intelligence of emotions*, Cambridge University Press, Cambridge, UK, 2001.
- [8] T. Eerola, J. K. Vuoskoski, H. Kautiainen, Being moved by unfamiliar sad music is associated with high empathy, *Frontiers in Psychology* 7 (2016) 1176. doi:10.3389/fpsyg.2016.01176.
URL <https://www.frontiersin.org/article/10.3389/fpsyg.2016.01176>
- [9] J. K. Vuoskoski, B. Thompson, D. McIlwain, T. Eerola, Who enjoys listening to sad music and why?, *Music Perception* 29 (3) (2012) 311–317.
- [10] J. K. Vuoskoski, T. Eerola, Can sad music really make you sad? indirect measures of affective states induced by music and autobiographical memories, *Psychology of Aesthetics, Creativity, and the Arts* 6 (3) (2012) 204–213.
- [11] S. O. Ali, Z. F. Peynircioğlu, Songs and emotions: are lyrics and melodies equal partners?, *Psychology of Music* 34 (4) (2006) 511–534.
- [12] A. Fiveash, G. Luck, Effects of musical valence on the cognitive processing of lyrics, *Psychology of Music* 44 (2) (2016) 1346–1360. doi:10.1177/0305735615628057.
- [13] M. Tervaniemi, Pleasure of sad music – from descriptions toward explanations: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* doi:https://doi.org/10.1016/j.plrev.2018.03.011.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300484>
- [14] R. Parncutt, The emotional connotations of major versus minor tonality: One or more origins?, *Musicae Scientiae* 18 (3) (2014) 324–353.

- [15] K. Overly, Dynamic emotional narratives and vocal expression: Response to “an integrative review of the enjoyment of sadness associated with music”, *Physics of Life Reviews*.
- 470 [16] A. Gabrielsson, E. Lindström, The role of structure in the musical expression of emotions, *Handbook of music and emotion: Theory, research, applications* (2010) 367–400.
- [17] A. J. Van den Tol, J. Edwards, N. A. Heflick, Sad music as a means for acceptance-based coping, *Musicae Scientiae* 20 (1) (2016) 68–83.
- 475 [18] M. Pelowski, T. Ishizu, H. Leder, Sadness and beauty in art—do they really coincide in the brain?: Comment on “an integrative review of the enjoyment of sadness associated with music” by eerola et al., *Physics of Life Reviews*doi:<https://doi.org/10.1016/j.plrev.2018.03.013>.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300502>
- [19] A. Gabrielsson, Strong experiences with music: Music is much more than just music, Oxford University Press, 2011.
- 480 [20] T. Eerola, H.-R. Peltola, Memorable experiences with sad music - reasons, reactions and mechanisms of three types of experiences, *PLoS ONE* 11 (6) (2016) e0157444. doi:<http://dx.doi.org/10.1371/journal.pone.0157444>.
- [21] P. N. Juslin, P. Laukka, Expression, Perception, and Induction of Musical Emotions: A Review and a Questionnaire Study of Everyday Listening, *Journal of New Music Research* 33 (3) (2004) 217–238.
- [22] P. N. Juslin, G. T. Barradas, M. Ovsiannikow, J. Limmo, W. F. Thompson, Prevalence of emotions, mechanisms, and motives in music listening: A comparison of individualist and collectivist cultures., *Psychomusicology: Music, Mind, and Brain* 26 (4) (2016) 293.
- 485 [23] L. Taruffi, S. Koelsch, The paradox of music-evoked sadness: An online survey, *PLoS ONE* 9 (10) (2014) e110490. doi:[10.1371/journal.pone.0110490](https://doi.org/10.1371/journal.pone.0110490).
- [24] M. Zentner, D. Grandjean, K. Scherer, Emotions evoked by the sound of music: Characterization, classification, and measurement, *Emotion* 8 (4) (2008) 494–521.
- 490 [25] J. H. Zickfeld, The nature of music-induced sadness and the role of kama muta: Comment on “an integrative review of the enjoyment of sadness associated with music” by eerola et al., *Physics of Life Reviews*doi:<https://doi.org/10.1016/j.plrev.2018.03.005>.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300423>
- [26] H.-R. Peltola, T. Eerola, Fifty shades of blue: Classification of music-evoked sadness, *Musicae Scientiae* 20 (1) (2016) 84–102.
- 495 [27] J. K. Vuoskoski, T. Eerola, The pleasure evoked by sad music is mediated by feelings of being moved, *Frontiers in Psychology* 8 (2017) 439.
- [28] W. F. Thompson, K. N. Olsen, On the enjoyment of violence and aggression in music, *Physics of Life Reviews*doi:<https://doi.org/10.1016/j.plrev.2018.03.016>.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300538>
- 500 [29] M. D. Mauk, D. V. Buonomano, The neural basis of temporal processing, *Annual Review of Neuroscience* 27 (1) (2004) 307–340, PMID: 15217335. arXiv:<https://doi.org/10.1146/annurev.neuro.27.070203.144247>, doi:[10.1146/annurev.neuro.27.070203.144247](https://doi.org/10.1146/annurev.neuro.27.070203.144247).
URL <https://doi.org/10.1146/annurev.neuro.27.070203.144247>
- 505 [30] R. N. Spreng, R. A. Mar, A. S. Kim, The common neural basis of autobiographical memory, prospection, navigation, theory of mind, and the default mode: a quantitative meta-analysis, *Journal of cognitive neuroscience* 21 (3) (2009) 489–510.
- [31] E. Wassiliwizky, S. Koelsch, V. Wagner, T. Jacobsen, W. Menninghaus, The emotional power of poetry: Neural circuitry, psychophysiology and compositional principles, *Social Cognitive and Affective Neuroscience* 12 (8) (2017) 1229–1240.
- 510 [32] I. J. Roseman, Transformative events: Appraisal bases of passion and mixed emotions, *Emotion Review* 9 (2) (2017) 133–139.
- [33] J. A. Russell, Mixed emotions viewed from the psychological constructionist perspective, *Emotion Review* 9 (2) (2017) 111–117.
- [34] K. N. Ochsner, S. A. Bunge, J. J. Gross, J. D. Gabrieli, Rethinking feelings: an fmri study of the cognitive regulation of emotion, *Journal of cognitive neuroscience* 14 (8) (2002) 1215–1229.
- 515 [35] T. Ishizu, S. Zeki, The experience of beauty derived from sorrow, *Human Brain Mapping* 38 (8) (2017) 4185–4200.
- [36] W. Menninghaus, V. Wagner, J. Hanich, E. Wassiliwizky, T. Jacobsen, S. Koelsch, The distancing–embracing model of the enjoyment of negative emotions in art reception, *Behavioral and Brain Sciences* (2017) 1–58.
- [37] L. F. Barrett, T. D. Wager, The structure of emotion: evidence from neuroimaging studies, *Current Directions in Psychological Science* 15 (2) (2006) 79–83.
- 520 [38] K. A. Lindquist, T. D. Wager, H. Kober, E. Bliss-Moreau, L. F. Barrett, The brain basis of emotion: a meta-analytic review, *Behavioral and Brain Sciences* 35 (3) (2012) 121–143.
- [39] M. Suzuki, N. Okamura, Y. Kawachi, M. Tashiro, H. Arao, T. Hoshishiba, J. Gyoba, K. Yanai, Discrete cortical regions associated with the musical beauty of major and minor chords, *Cognitive, Affective, & Behavioral Neuroscience* 8 (2) (2008) 126–131. doi:[10.3758/CABN.8.2.126](https://doi.org/10.3758/CABN.8.2.126).
URL <https://doi.org/10.3758/CABN.8.2.126>
- 525 [40] A. Kawakami, K. Furukawa, K. Katahira, K. Okanoya, Sad music induces pleasant emotion, *Emotion Science* 4 (2013) 311. doi:[10.3389/fpsyg.2013.00311](https://doi.org/10.3389/fpsyg.2013.00311).
- [41] T. Eerola, J. K. Vuoskoski, A review of music and emotion studies: Approaches, emotion models and stimuli, *Music Perception* 30 (3) (2012) 307–340.
- 530 [42] W. Trost, T. Ethofer, M. Zentner, P. Vuilleumier, Mapping aesthetic musical emotions in the brain, *Cerebral Cortex* 22 (12) (2012) 2769–2783.

- [43] T. Jacobsen, Cultural sciences and representation of culture in the mind, and body: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* doi:<https://doi.org/10.1016/j.plrev.2018.01.013>.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300149>
- [44] E. Brattico, B. Bogert, T. Jacobsen, Toward a neural chronometry for the aesthetic experience of music, *Frontiers in Psychology* 4 (2013) 206. doi:10.3389/fpsyg.2013.00206.
URL <https://www.frontiersin.org/article/10.3389/fpsyg.2013.00206>
- [45] T. Jacobsen, Bridging the arts and sciences: A framework for the psychology of aesthetics (2006).
- [46] M. Tamir, What do people want to feel and why? Pleasure and utility in emotion regulation, *Current Directions in Psychological Science* 18 (2) (2009) 101–105.
- [47] S. Saarikallio, Re-thinking the paradox as catalyzed processing: Enjoyment of sadness in music as facilitated emotional processing: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* doi:<https://doi.org/10.1016/j.plrev.2018.03.006>.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300435>
- [48] L. S. Greenberg, A. Pascual-Leone, Emotion in psychotherapy: A practice-friendly research review, *Journal of clinical psychology* 62 (5) (2006) 611–630.
- [49] L. Taruffi, Sad music and self-reflection: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* doi:<https://doi.org/10.1016/j.plrev.2018.03.007>.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300447>
- [50] L. Taruffi, C. Pehrs, S. Skouras, S. Koelsch, Effects of sad and happy music on mind-wandering and the default mode network, *Scientific reports* 7 (1) (2017) 14396.
- [51] A. M. Morcom, P. C. Fletcher, Does the brain have a baseline? why we should be resisting a rest, *Neuroimage* 37 (4) (2007) 1073–1082.
- [52] T. Adorno, *The Culture Industry*, Routledge, Abingdon, 2004.
- [53] J. Krueger, Musical scaffolding and the pleasure of sad music: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* doi:<https://doi.org/10.1016/j.plrev.2018.01.010>.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300113>
- [54] T. Cochrane, Expression and extended cognition, *The Journal of Aesthetics and Art Criticism* 66 (4) (2008) 329–340.
- [55] T. DeNora, *Music in everyday life*, Cambridge University Press, 2000.
- [56] W. Menninghaus, V. Wagner, J. Hanich, E. Wassiliwizky, M. Kuehnast, T. Jacobsen, Towards a psychological construct of being moved, *PLoS ONE* 10 (6) (2015) e0128451. doi:10.1371/journal.pone.0128451.
- [57] S. H. Saarikallio, Music in mood regulation: Initial scale development, *Musicae Scientiae* 12 (2) (2008) 291–309.
- [58] S. R. Livingstone, W. F. Thompson, The emergence of music from the theory of mind, *Musicae Scientiae* 13 (2) (2009) 83–115.
- [59] L. Perlovsky, Music and cognitive dissonance: Comment on “an integrative review of the enjoyment of sadness associated with music” by tuomas eerola et al., *Physics of Life Reviews* doi:<https://doi.org/10.1016/j.plrev.2018.03.012>.
URL <http://www.sciencedirect.com/science/article/pii/S1571064518300496>
- [60] N. Masataka, L. Perlovsky, Music can reduce cognitive dissonance, *Nature Precedings* (2012) 319–23.
- [61] A. P. Fiske, B. Seibt, T. Schubert, The sudden devotion emotion: Kama muta and the cultural practices whose function is to evoke it, *Emotion Review* (2017) 1754073917723167.
- [62] K. Schäfer, T. Eerola, Social surrogacy: How music and other media provide a sense of belonging, *Psychology of Music*.
- [63] J. H. Zickfeld, T. W. Schubert, B. Seibt, A. P. Fiske, Empathic concern is part of a more general communal emotion, *Frontiers in psychology* 8 (2017) 723.
- [64] J. J. Gross, Emotion regulation: Current status and future prospects, *Psychological Inquiry* 26 (1) (2015) 1–26.
- [65] E. K. Kalokerinos, M. Résibois, P. Verduyn, P. Kuppens, The temporal deployment of emotion regulation strategies during negative emotional episodes, *Emotion* 17 (3) (2017) 450.